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ABSTRACT

This project is part of an ongoing study of the influence of schooling on observed household behavior. The study has previously determined that more educated individuals behave as if they are more proficient consumers, and that, in particular, more educated couples systematically select more efficient contraceptive techniques. The recent research effort has focused on two questions: 1) the relationship between schooling and the household's capacity to predict its purchases of durable good within the near future (12 months), and 2) the relationship between schooling and marital behavior, and in particular the interaction between schooling and measured I.Q. as determinants of marital behavior. Both studies are in the early stages of analysis. Initial results on the second topic suggest that at very high levels of abil'ty men and women with more schooling marry at later ages, select more educated mates, and are more maritally stable. These results suggest that the observed influence of schooling on marital behavior for the population at large persists at very high levels of ability. (Author)

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Final Report

Project No. 2- 0783

Grant No. OEG - 0 - 72-2557

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# THE ROLE OF EDUCATION IN PRODUCTION WITHIN THE HOUSEHOLD

September 1973

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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## Author's Abstract

This project is part of an ongoing study of the influence of schooling on observed household behavior. The study has previously determined that more educated individuals behave as if they are more proficient consumers, and that, in particular, more educated couples systematically select more efficient contraceptive techniques, other things the same. The recent research effort has focused on two questions: (1) the relationship between schooling and the household's capacity to predict its purchases of durable goods within the near future (12 months), and (2) the relationship between schooling and marital behavior, and in particular the interaction between schooling and measured I.Q. as determinants of marital behavior. Both studies are in the early stages of analysis. Initial results on the second topic suggest that at very high levels of ability (i.e., measured childhood I.Q. above 135) men and women with more schooling marry at later ages, select more educated mates, and are more maritally stable. These results suggest that the observed influence of schooling on marital behavior for the population at large persists at very high levels of ability.

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261 Madison Avenue
New York, New York 10016

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# Research Report

## INTRODUCTION

Although this report is a "final" report on a research grant, it is by no means a final report on the research. On the contrary, it reports on the initial stages of the empirically oriented research projects undertaken during this grant year. The topic to which the research has been directed is the influence of education, or formal schooling, on observed behavior outside of labor markets. It has long been recognized that the influence of education on behavior is a pervasive one. Indeed, as a result of its systematic influence on behavior one of the common socioeconomic characteristics by which social scientists categorize people is their level of schooling. Also as a result of its alleged influence on behavior, governments frequently impose laws regulating the minimum permissible exposure to schooling on the grounds that individuals are "better" citizens if they are literate and possess a basic level of information about a number of subjects.

One of the few aspects of education's influence which has been studied in depth is the relationship between schooling and earning capacity in the labor market. Numerous studies in the past decade have shown that earnings are systematically related to schooling and that the purchase of some level of higher education is a wise investment for most people when the return on that investment is measured in enhanced earnings alone (see Becker 1964; Mincer 1974 for example).

However, since the asset acquired through schooling is embodied in an individual, it seems reasonable to suppose that its influence on attitudes, behavioral patterns, and the productivity of time is not limited to the time an individual spends in the labor market. Indeed, it seems reasonable to hypothesize that if schooling influences the productivity of time in labor market activities, it may also affect the productivity of time in other activities as well.

Furthermore, if schooling affects the productivity of one's time in activities outside of the labor market, this would seem to be an important "return" on an investment in schooling since even an individual employed full-time typically spends less than one quarter of each week at the job. The long-run research goal towards which this research project is directed is the determination of the way in which, and the extent to which, education affects productivity outside the labor market.

RESEARCH DESIGN AND METHODS

In previous studies I have pursued this research goal using the household production function approach to consumer behavior. In this approach, suggested by Becker (Becker 1965), households are viewed as small firms which produce desired products by using the household members' time resources and purchased market goods and services. For example, within the household kitchen equipment, groceries, recipes, and some amount of the family member's time are combined to produce nutritious meals. Households similarly produce many other commodities by combining goods and services with the family members' time. The bundle of products produced within the household is determined by the family's preferences for the various commodities and by their relative costs of production.

In this framework, nonmarket activities in which individuals engage can be characterized as productive activities through which their time and market goods and services are transformed into desirable commodities-- nutrition, companionship, travel experiences, good health, and so on.

I have previously argued (see Michael 1972) that the education level of household members may affect the efficiency with which production takes place in the household. Under the assumptions specified in the model, I was able to obtain a rough estimate of

the average magnitude of the effect of formal schooling on nonmarket productivity. Education appeared to have a positive effect on productivity in the home: families behaved as if schooling improved the efficiency with which nonmarket production took place. If in fact schooling enhances the proficiency with which household production is performed, then differences in education level among households may result in differences in real wealth and in differences in the relative prices of various nonmarket commodities.

Having obtained some indirect evidence that schooling enhances productivity in the nonmarket sector of the economy, I have begun to explore the mechanisms through which education may affect productivity. In one such study I attempted to identify an activity in which several different productive techniques of varying technical efficiency existed in the marketplace at a single point in time and in which the state of technology was rapidly changing. It has been alleged that one of the ways in which education affects productivity is by affecting one's capacity to acquire, evaluate and adopt new ideas, and it seems likely that one would observe this effect where technology is changing at a relatively rapid pace.[1]

Focusing on the activity of birth control, I studied the adoption of specific contraceptive techniques by birth interval, desired number of children, race, religion, and by the education level of the husband and wife. The empirical results (using a 1965 national survey of U.S. women) suggested that more educated couples, other things the same, do tend to adopt contraceptive techniques which on the average are more effective in preventing unwanted pregnancies (see Michael 1973). The results could not distinguish whether the more educated couples adopted inherently better contraceptive techniques or whether more educated couples used more effectively the contraceptive techniques which they adopted.

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[1]This "allocative" effect of schooling has been studied in depth by Welch (see Welch 1970 and 1973). Also see Schultz 1964.

I have begun two new research projects this past year, both of which focus on the mechanisms through which schooling affects nonmarket behavior. The first focuses on the relationship between the level of schooling attained and subsequent marital behavior. This study has a two-fold emphasis. It distinguishes the effects of schooling by the individual's sex, a distinction often ignored in studies which make use of the level of schooling of only one of the adult family members. More importantly, the data set employed is a sample of men and women with extremely high I.Q.s, and hence the study attempts to distinguish the influence of schooling from the influence of native ability or measured IQ or marital behavior. Marriage formation and dissolution are exceptionally important events in one's lifetime, and factors which influence marital behavior indirectly affect many other dimensions of nonmarket behavior. Fertility, geographical and occupational mobility, savings and consumption expenditure patterns are among the aspects of nonmarket behavior which appear to be related to marriage patterns, so the determinants of the timing, stability, and success of marriage are of considerable interest to the social scientist.

One of the ways in which schooling may affect marital behavior is by affecting one's proficiency at planning for the future and at anticipating future behavior. The second of the two projects which I have undertaken focuses more directly on the evidence about the relationship between schooling level and anticipation of future behavior. Using longitudinal survey data on anticipated future purchases, I am investigating whether more educated couples can more accurately predict their future purchases of consumer durable goods.

Both of these research projects were begun within the past year and although the data have been prepared for analysis and several of the important analytical issues explored, neither project is near completion. The results reported in the following section summarize some of the more interesting and suggestive ini-

tial findings on this research which I am continuing to pursue.

## RESULTS[1]

### Education and Marital Behavior

Schooling is frequently observed to be highly correlated with individual characteristics such as wage earning power, health status, geographical mobility, fertility, and marital status. Some have argued that these observed correlations do not result from the direct influence of schooling on behavior but rather from the influence of some third factor which is highly correlated with schooling. For example, innate intelligence and parental wealth are known to be highly correlated with one's level of schooling, and it has been argued that the observed positive relationship between schooling and hourly wages may simply reflect the higher ability or greater parental wealth of more educated workers.

This issue is of considerable importance when schooling is viewed as a mechanism for enhancing one's productive capacity and well-being. If schooling functions only as an index of genetic or early childhood environmental factors then schooling may not be the appropriate vehicle for improving one's circumstances. If, however, schooling provides useful skills and knowledge and alters one's capacities and attitudes in desirable ways, then schooling may itself influence observed behavior independently of (or interactively with) native ability, childhood environment and other factors.

One of the purposes of the study of the marital patterns of the Terman sample of geniuses is to determine whether formal schooling affects the marital behavior of these high-I.Q. men and women as it affects the marital behavior of the population at large. If the effects are similar for the two groups, we can then be more certain that the observed correlation between schooling and marital pattern in the population is not simply a reflection of the

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[1]I want to acknowledge with thanks the outstanding research assistance of Mr. David Lindauer who worked with me throughout the grant year.

influence of ability on marital behavior.

Several recent, large, nation-wide surveys in the United States have revealed that formal schooling is systematically related to several dimensions of marital behavior. There is considerable evidence that more educated individuals tend to have somewhat different marital patterns-- in terms of characteristics of their spouses and the incidence, timing, and stability of their marriages.

Findings from the U.S. Census of the Population in 1960, recent Current Population Surveys, the 1967 Survey of Economic Opportunity, and the 1965 and 1970 National Fertility Surveys, for example, all tend to show that more educated men and women marry at later ages. Furthermore, nearly all U.S. cross-sectional surveys indicate statistically significant positive correlations between the level of schooling of spouses -- more educated individuals tend to select relatively more educated mates. There is also evidence that among women, higher levels of schooling are associated with relatively lower marriage rates.[1]

Recent work on the theory of marriage (See Becker, 1973) offers an explanation -- in terms of the expected gains from marriage -- of the observed positive assortative mating and of the lower incidence of marriage among well-educated women. The postponement of marriage by the more educated may be related to the

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[1]See U.S. Bureau of the Census, Census of Population, 1960. Subject Reports, Marital Status, PC (2) - 4E and Age at First Marriage, PC(2) - 4D, also see Santos 1972. See U.S. Bureau of the Census, Current Population Reports, Population Characteristics, Series P-20, No. 198 (March 25, 1970) No. 212 (February 1, 1971), No. 225 (November 1971) No. 239 (September 1972) and No. 242 (November 1972). The SEO data set is reported in CPR Series P-20 No. 223 (October 7, 1971) and is explored in greater detail regarding age at marriage in Keeley, 1973. For findings from the Growth of American Family Surveys and the National Fertility Surveys see Whelpton, Campbell and Patterson 1966, Ryder and Westoff 1971, and Bumpass and Sweet 1972.

negative correlation between schooling and desired fertility or to the relatively high time-intensity of schooling and activities related to the early years of marriage.[1]

To determine if these observed relationships of schooling and marital behavior persist when measured ability or intelligence is held constant, I am engaged in an analysis of the marital behavior of the Terman sample. In 1921, Professor Lewis M. Terman began a study of about fifteen hundred elementary school-aged children from California. The principal criterion for selection of the sample was a measured I.Q. within the top one per cent of the general school population-- I.Q.s generally in excess of 140. The non-random sample consists of 857 males and 671 females and this group of subjects has been re-surveyed at numerous times since the early 1920's. The analysis of this rich data set formed the basis of a series of volumes entitled Genetic Studies of Genius reporting on the research conducted by Terman and his associates at Stanford University. In the late 1960's the National Bureau obtained much of the data from the surveys of the Terman sample, and with the financial support of the National Science Foundation prepared a useable data file. This data file contained information on the marital histories and current marital status of the Terman subjects

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[1] If the demand for marriage is essentially a derived demand emanating from a more fundamental demand for offspring, then the lower demand for children by the more educated would be reflected in a lower demand for marriage and hence a postponement in the date of marriage.

Alternatively, if both schooling and childbearing require relatively much time, they are more likely to be done sequentially than concomitantly, and this too may result in postponement of marriage by individuals who attend school for more years.

in 1960, at which time the subjects were generally in their late-forties, or early-fifties.

The accompanying tables, Table 1 through Table 6, reflect the findings from a preliminary study of these data. Table 1 indicates the distribution of educational attainment from the Terman sample and from the comparable sex-specific U.S. cohort. While less than five per cent of the relevant U.S. population had post-graduate schooling, nearly fifty per cent of the Terman men and nearly forty per cent of the Terman women had attended schooling beyond college. Not surprisingly, these unusually able people had attained an unusually high level of schooling.

Table 2 indicates the marital status of the Terman sample and its U.S. cohort. Holding education constant, the men in the Terman sample have essentially the same marital pattern as the U.S. cohort as a whole. The Terman women, however, holding education constant, appear to have a lower incidence of singleness and widowhood and a considerably higher rate of marriage and divorce. The relationship between education and marital status in the Terman sample is quite similar to the relationship between education and marital status in the U.S. population. In particular, among women the more educated in both the Terman sample and the U.S. population appeared to have a higher incidence of singleness. The surprisingly high rate of divorce among the Terman women is negatively related to their schooling. Thus, although the level of the incidence of marriage and divorce is higher among Terman women than among the U.S. women as a whole, schooling appears to have quite comparable qualitative effects on marital status in those two populations of high-I.Q. and average I.Q. men and women.

The four panels of Table 3 indicate in greater detail the marital history of the Terman subjects by education. Here again one observes the quite common finding that the influence of schooling on behavior in the nonmarket sector is stronger for women than

Table 1

Educational Attainment

Distribution for Terman Sample and US White Population

Persons aged 45-54 in 1960
by sex

| Education (yrs.) | Males | | Females | |
|---|---|---|---|---|
| | US Pop* (%) | Terman (%) | US Pop* (%) | Terman (%) |
| ≤8 | 40.8 | 0.0 | 35.9 | 0.0 |
| 9-11 | 21.1 | 1.0 | 21.7 | 1.6 |
| 12 | 20.6 | 6.7 | 25.8 | 10.5 |
| 13-15 | 8.5 | 18.2 | 9.9 | 18.8 |
| 16 | 4.6 | 25.8 | 4.4 | 30.1 |
| ≥17 | 4.4 | 48.3 | 2.3 | 39.0 |

*Source: U.S. Census of Population: 1960; Report PC(2) - 4E, Table 4

Table 2

Marital Status by Education
US White Population and Terman Sample
Persons aged 45-54 in 1960 by sex

| Education | Single | Ever Married | Married Spouse present | Widowed | Divorced | (sample) size |
|---|---|---|---|---|---|---|
| U.S. White Population:* Males | | | | | | |
| ≤8 | 9.0 | 91.0 | 82.4 | 1.9 | 3.2 | |
| 9-11 | 6.0 | 94.0 | 86.6 | 1.5 | 3.1 | |
| 12 | 6.1 | 93.9 | 87.2 | 1.3 | 2.8 | |
| 13-15 | 5.4 | 94.6 | 88.1 | 1.3 | 2.7 | |
| 16 | 5.6 | 94.4 | 89.1 | 1.0 | 2.0 | |
| ≥17 | 8.2 | 91.8 | 87.5 | 0.9 | 1.6 | |
| Total | 7.3 | 92.7 | 85.3 | 1.6 | 2.9 | |
| Terman Sample: Males | | | | | | |
| 12 | 5.1 | 94.9 | 87.2 | 0.0 | 7.7 | (39) |
| 13-15 | 5.7 | 94.3 | 91.5 | 0.0 | 2.8 | (106) |
| 16 | 7.3 | 92.7 | 88.0 | 0.7 | 4.0 | (150) |
| ≥17 | 5.7 | 94.3 | 90.4 | 0.4 | 3.6 | (281) |
| Total[1] | 6.0 | 94.0 | 89.7 | 0.3 | 4.0 | (582) |
| U.S. White Population: Females | | | | | | |
| ≤8 | 5.8 | 94.2 | 77.3 | 9.3 | 3.7 | |
| 9-11 | 5.1 | 94.9 | 79.4 | 7.9 | 4.4 | |
| 12 | 7.3 | 92.7 | 79.1 | 6.8 | 4.3 | |
| 13-15 | 8.1 | 91.9 | 77.8 | 7.2 | 4.5 | |
| 16 | 13.4 | 86.6 | 74.6 | 6.1 | 3.7 | |
| ≥17 | 30.1 | 69.9 | 55.8 | 6.8 | 5.2 | |
| Total | 7.1 | 92.9 | 77.7 | 7.9 | 4.1 | |
| Terman Sample: Females | | | | | | |
| 12 | 5.8 | 94.2 | 76.9 | 3.8 | 13.5 | (52) |
| 13-15 | 4.3 | 95.7 | 82.8 | 1.1 | 11.8 | (93) |
| 16 | 6.0 | 94.0 | 83.2 | 5.4 | 5.4 | (149) |
| ≥17 | 17.1 | 82.9 | 71.0 | 4.1 | 7.8 | (193) |
| Total[1] | 9.9 | 90.1 | 77.8 | 3.8 | 8.5 | (495) |

*Source: U.S. Census, Subject Report Marital Status, PC(2)-4E, Table 4.

[1]Includes persons with educational levels less than 12 years.

Table 3

Marital History

Terman sample by education, age and sex

(A)
Males age 45-49 in 1960

| 1960 Marital Status | Educational Attainment | | | | Total |
|---|---|---|---|---|---|
| | ≤12 | 13-15 | 16 | ≥17 | |
| | (Column Percentages) | | | | |
| Always Single | 8.0 | 7.7 | 7.4 | 5.8 | 6.8 |
| Ever Married | 92.0 | 92.3 | 92.6 | 94.2 | 93.2 |
| Married once | | | | | |
| Spouse present | 72.0 | 49.2 | 76.6 | 79.9 | 72.5 |
| Divorced | 8.0 | 3.1 | 1.1 | 1.9 | 2.4 |
| Widowed | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Separated | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total | 80.0 | 52.3 | 77.7 | 81.8 | 74.9 |
| Married twice | | | | | |
| Spouse present | 4.0 | 32.3 | 11.7 | 9.7 | 14.2 |
| Divorced | 4.0 | 0.0 | 0.0 | 0.6 | .6 |
| Total | 8.0 | 32.3 | 11.7 | 10.3 | 14.8 |
| Married three times | | | | | |
| Spouse present | 4.0 | 7.7 | 3.2 | 1.9 | 3.6 |
| (Sample size) | (25) | (65) | (94) | (154) | (338) |

Table 3
continued

(B)
Males age 50-54 in 1960

| 1960 Marital Status | Educational Attainment | | | | Total |
|---|---|---|---|---|---|
| | ≤12 | 13-15 | 16 | ≥17 | |
| | (Column Percentages) | | | | |
| Always Single | 0.0 | 2.4 | 7.1 | 5.5 | 4.9 |
| Ever Married | 100.0 | 97.6 | 92.9 | 94.5 | 95.1 |
| Married once | | | | | |
| Spouse present | 85.0 | 63.4 | 62.5 | 75.6 | 71.3 |
| Divorced | 0.0 | 0.0 | 5.4 | 2.4 | 2.5 |
| Widowed | 0.0 | 0.0 | 1.8 | 0.8 | 0.8 |
| Separated | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total | 85.0 | 63.4 | 69.7 | 78.8 | 74.6 |
| Married twice | | | | | |
| Spouse present | 10.0 | 26.8 | 19.6 | 13.4 | 16.8 |
| Divorced | 5.0 | 2.4 | 3.6 | 2.4 | 2.9 |
| Total | 15.0 | 29.2 | 23.2 | 15.8 | 19.7 |
| Married three times | | | | | |
| Spouse present | 0.0 | 4.9 | 0.0 | 0.0 | 0.8 |
| (Sample size) | (20) | (41) | (56) | (127) | (244) |

Table 3
continued

(C)
Females age 45-49 in 1960

| 1960 Marital Status | Educational Attainment | | | | Total |
|---|---|---|---|---|---|
| | ≤12 | 13-15 | 16 | ≥17 | |
| | (Column Percentages) | | | | |
| Always Single | 7.7 | 3.3 | 6.6 | 14.3 | 8.8 |
| Ever Married | 92.3 | 96.7 | 93.4 | 85.7 | 91.2 |
| Married once | | | | | |
| Spouse present | 53.8 | 68.3 | 74.7 | 62.9 | 66.4 |
| Divorced | 2.6 | 13.3 | 4.4 | 6.7 | 6.8 |
| Widowed | 5.1 | 1.7 | 5.5 | 2.9 | 3.7 |
| Separated | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total | 61.5 | 83.3 | 84.6 | 72.5 | 76.9 |
| Married twice | | | | | |
| Spouse present | 12.8 | 10.0 | 8.8 | 7.6 | 9.1 |
| Divorced | 7.7 | 1.7 | 0.0 | 2.9 | 2.4 |
| Total | 20.5 | 11.7 | 8.8 | 10.5 | 11.5 |
| Married three times | | | | | |
| Spouse present | 10.3 | 1.7 | 0.0 | 2.9 | 2.7 |
| (Sample size) | (39) | (60) | (91) | (105) | (295) |

Table 3
continued

(D)
Females age 50-54 in 1960

| 1960 Marital Status | Educational Attainment <12 | 13-15 | 16 | >17 | Total |
|---|---|---|---|---|---|
| | (Column Percentages) | | | | |
| Always Single | 0.0 | 6.1 | 5.2 | 20.5 | 11.5 |
| Ever Married | 100.0 | 93.9 | 94.8 | 79.5 | 88.5 |
| Married once | | | | | |
| Spouse present | 61.9 | 72.7 | 77.6 | 64.8 | 69.5 |
| Divorced | 14.3 | 3.0 | 3.4 | 4.5 | 5.0 |
| Widowed | 0.0 | 0.0 | 5.2 | 5.7 | 4.0 |
| Separated | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Total | 76.2 | 75.7 | 86.2 | 75.0 | 78.5 |
| Married twice | | | | | |
| Spouse present | 19.0 | 12.1 | 5.1 | 3.4 | 7.0 |
| Divorced | 4.8 | 3.0 | 3.4 | 1.1 | 2.5 |
| Total | 23.8 | 15.1 | 8.5 | 4.5 | 9.5 |
| Married three times | | | | | |
| Spouse present | 0.0 | 3.0 | 0.0 | 0.0 | 0.5 |
| (Sample size) | (21) | (33) | (58) | (88) | (200) |

for men. The strong positive effect of women's schooling on singleness and the negative effect on divorce and second marriages are quite pronounced. One interesting finding indicated in Table 3 is the remarkably high rate of re-marriage among the Terman men. For the two successive five year age cohorts, the percentage of the men ever divorced or widowed who re-married at least once is eighty-eight per cent and eighty-six per cent respectively. The comparable figures for the two five year age cohorts of Terman women are fifty-eight per cent and fifty-three per cent respectively. In other words, more than four out of five of the Terman men who were divorced or widowed remarried, while only about half of the Terman women who were divorced or widowed remarried by 1960.

Since one of the most important factors related to marital instability in the population is the age at first marriage, and since a surprisingly large fraction of the Terman women appear to be maritally unstable, as measured by their rate of divorce, it is interesting to compare the age at first marriage in the Terman sample with that of the U.S. population as a whole. Table 4 indicates the frequently cited and quite strong positive relationship for the U.S. population between level of schooling and age at marriage. Panel A of Table 4 indicates that schooling affects the age at marriage within the Terman sample in qualitatively the same way that it affects age at marriage in the population at large: the more educated marry later. Notice, however, that for both sexes, at any given level of schooling the Terman subjects married on average earlier than their comparable U.S. cohort. I have no satisfactory explanation for the observation that ceteris paribus, the Terman subjects married at younger ages. One possible explanation, which has not yet been substantiated, is that the Terman subjects completed a given level of schooling at a relatively younger age, having skipped lower grades of school.

Table 4

Age at First Marriage by Education Level
Persons age 45-54 in 1960 by sex

(A)
Terman Sample

| Education | Age at First Marriage | | | | | | Mean* Age | Median Age | (cell) size |
|---|---|---|---|---|---|---|---|---|---|
| | ≤22 | 23-25 | 26-28 | 29-31 | 32-34 | ≥35 | | | |
| **Males** | | | | | | | | | |
| ≤12 | 42.3 | 15.4 | 15.4 | 19.2 | 7.7 | 0 | 25.0 | 24.5 | (26) |
| 13-15 | 33.8 | 29.2 | 20.0 | 6.2 | 6.2 | 4.6 | 25.2 | 24.7 | (65) |
| 16 | 16.5 | 32.1 | 24.8 | 17.4 | 4.6 | 4.6 | 26.4 | 26.2 | (109) |
| ≥17 | 13.1 | 30.2 | 32.2 | 13.6 | 8.0 | 3.0 | 26.6 | 26.6 | (199) |
| **Females** | | | | | | | | | |
| ≤12 | 67.3 | 14.3 | 10.2 | 4.1 | 4.1 | 0 | 22.9 | 22.3 | (49) |
| 13-15 | 53.7 | 22.4 | 9.0 | 6.0 | 4.5 | 4.5 | 24.1 | 22.1 | (67) |
| 16 | 33.6 | 45.8 | 15.0 | 3.7 | 0.9 | 0.9 | 23.8 | 24.1 | (107) |
| ≥17 | 17.6 | 33.6 | 23.2 | 15.2 | 4.8 | 5.6 | 26.3 | 25.9 | (125) |

*Computed with age 21 assigned to the lower open-ended group; age 38 assigned to the upper open-ended group.

(B)
U.S. White Population*

| Education | ≤22 | 23-24 | 25-29 | 30-34 | ≥35 | Median Age |
|---|---|---|---|---|---|---|
| **Males** | | | | | | |
| 9-11 | 35.7 | 16.7 | 28.1 | 11.7 | 7.8 | 24.7 |
| 12 | 27.4 | 17.3 | 32.5 | 13.8 | 9.0 | 25.8 |
| 13-15 | 22.9 | 17.6 | 35.9 | 14.8 | 8.8 | 26.3 |
| 16 | 13.3 | 17.3 | 42.4 | 17.3 | 9.7 | 27.3 |
| ≥17 | 10.9 | 14.6 | 45.2 | 19.1 | 10.3 | 27.7 |
| Total (all Ed.)[1] | 31.8 | 16.5 | 30.0 | 12.9 | 8.8 | 25.3 |
| **Females** | | | | | | |
| 9-11 | 65.8 | 10.7 | 13.9 | 5.5 | 4.0 | 21.0 |
| 12 | 52.0 | 14.4 | 20.3 | 7.9 | 5.4 | 22.8 |
| 13-15 | 41.9 | 17.7 | 25.5 | 9.1 | 5.8 | 23.9 |
| 16 | 24.8 | 20.4 | 34.6 | 12.2 | 8.0 | 25.7 |
| ≥17 | 21.1 | 16.8 | 33.0 | 15.5 | 13.5 | 26.8 |
| Total (all Ed.)[1] | 58.4 | 12.4 | 17.4 | 6.8 | 5.0 | 21.9 |

*Source: U.S. Census, 1960, Subject Report "Age at First Marriage", PC(2) 4D,Table 9

[1]Includes persons with educational levels less than 9 years.

This relatively early age at marriage among the Terman subjects may explain the relatively high levels of marital instability. Table 5 indicates the relationship between age at first marriage and marital instability within the Terman sample. The incidence of divorce declines dramatically as the age at marriage rises.

Table 6 indicates the separate effects of age at marriage and level of schooling on the incidence of divorce in the Terman sample. While the sample sizes are quite small and generalizations difficult, there appears to be a more systematic negative effect of age at first marriage than of level of schooling on the incidence of divorce. If this finding is sustained by subsequent analysis, it would be consistent with the findings from the 1970 National Fertility Survey that "differences in marital stability by education appear to be largely attributable to differences in age at marriage by education" (see Bumpass and Sweet, 1972).

The tentative conclusions from this preliminary analysis of the marital behavior of the Terman sample are these:

(1) Schooling affects marital behavior among these exceptionally high-I.Q. individuals in the same qualitative manner as it affects marital behavior in the population at large. The more educated marry at a later age, are maritally more stable, and marry relatively more educated mates. Among women, the more educated have a lower incidence of marriage.

(2) Thus the observed effects of schooling on marital behavior do not appear to reflect simply an effect of ability or native intelligence.

(3) On an age-, cohort- and an education-adjusted basis the Terman sample exhibits a greater incidence of marriage and divorce than does the population at large.

(4) There appears to be an interactive effect of schooling and ability on marital instability. The Terman subjects marry at

**Table 5**

**Marital History by Age at First Marriage**

Terman Sample, Ever Married, age 45 to 54 in 1960
by sex
(row percentages)

| Age at First Marriage | Marital History: Married Once Spouse Present | Divorced | Widowed | (Sample size) |
|---|---|---|---|---|
| Men | | | | |
| ≤ 22 | 62 | 32 | 5 | (77) |
| 23 - 25 | 78 | 22 | 0 | (119) |
| 26 - 28 | 79 | 19 | 3 | (108) |
| ≥29 | 90 | 10 | 0 | (96) |
| Women | | | | |
| ≤ 22 | 69 | 29 | 2 | (127) |
| 23 - 25 | 78 | 15 | 7 | (113) |
| 26 - 28 | 80 | 16 | 4 | (56) |
| ≥29 | 79 | 13 | 8 | (52) |

Table 6

Percentage Ever Divorced*

by Age at Marriage, Education, and Sex
for Terman Subjects age 45-54 in 1960

| Education | Age at Marriage | | | |
|---|---|---|---|---|
| | ≤22 | 23-25 | 26-28 | ≥29 |
| **Males** | | | | |
| 13-15 | 27.3 | 52.6 | 38.5 | 9.1 |
| | (22) [1] | (19) | (13) | (11) |
| 16 | 50.0 | 14.3 | 25.9 | 10.3 |
| | (18) | (35) | (27) | (29) |
| ≥17 | 26.9 | 16.7 | 7.8 | 12.2 |
| | (26) | (60) | (64) | (49) |
| All Ed.[2] | 32.5 | 22.0 | 18.5 | 10.4 |
| | (77) | (118) | (108) | (96) |
| **Females** | | | | |
| 13-15 | 22.2 | 6.7 | 16.7 | 40.0 |
| | (36) | (15) | (6) | (10) |
| 16 | 25.0 | 12.2 | 6.3 | 0.0 |
| | (36) | (49) | (16) | (6) |
| ≥17 | 18.2 | 21.4 | 24.1 | 6.3 |
| | (22) | (42) | (29) | (32) |
| All Ed. | 29.1 | 15.0 | 16.1 | 13.5 |
| | (127) | (113) | (56) | (52) |

*Percentage of ever married persons who were ever divorced.

1. Cell size on which the percentage is based.

2. Includes persons with educational levels less than 13 years.

a relatively young age, given their level of schooling, and they subsequently divorce at a relatively high rate. Ability appears to mitigate the deterrent effect of schooling on age at marriage, which in turn affects the rate of marital separation.

## Education and the Accuracy of Predictions about Future Purchases

Does education affect the accuracy with which people predict their future purchases of consumer durables? My interest in the question is related to implications about (a) the relationship between schooling and the period of time over which households plan their expenditure and savings behavior and (b) the relationship between schooling and the degree of uncertainty which households face regarding their economic and demographic circumstances.

The Consumer Anticipation Survey (CAS) conducted by the NBER and the U.S. Bureau of the Census would appear to be an ideal data set with which to study this question.[1] This panel survey was conducted in five waves beginning in May 1968 and initially included approximately 4500 households in suburban areas of Boston, Massachusetts; Minneapolis, Minnesota and San Jose, California. The first questionnaire of the survey sought information about the ownership of five household durables: kitchen ranges, washing machines, clothes dryers, refrigerators or freezers, and dishwashers. The respondent was also asked, "What are the chances that you or some family member will buy one or more of these items during the next twelve months?"

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[1] Anticipation surveys have proven useful in conjunction with short term forecasting models for predicting consumer demand (see Juster 1964 and Juster 1969 for example). The CAS survey was designed primarily to explore further the usefulness of this kind of ex ante data on consumer behavior and to consider sets of survey questions which differed in design from the questions employed in intensions surveys conducted by the University of Michigan's Survey Research Center and by the Census Bureau.

The CAS sample design was non-random. Sampling was restricted to relatively high income census tracts in three cities in order to insure relatively greater activity in expenditures on durable goods, savings

In two subsequent questionnaires administered at six month intervals, the respondent was asked, "Since your last visit have you or any family member purchased a kitchen range, washing machine, clothes dryer, refrigerator or freezer, or dishwasher?" So the survey contains information on the household's stated probability of purchase within the next twelve months (from May 1968) and information on actual purchases for the six months May 1968 through November 1968 and for the six months November 1968 through May 1969.

The analysis of these data is in a most preliminary state. This section of my report contains no more than a few cross tabulations indicating by income or education the relationship between prediction and purchase of any of these five durable goods within the one year span from May 1968 through May 1969. This initial exploration of the data set employs a group of 603 households in which the wife is aged 30-39.[1]

Table 7 indicates several characteristics of this set of 603 households, including the frequency distribution of years of schooling completed by the husband and by the wife and of the total 1967 family income. Panel B indicates the percentage of these

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(Cont.) patterns, vacation outlays and so forth. The survey was discussed in detail at a recent conference of the American Statistical Association. See Proceedings of the Social Statistics Section, American Statistical Association, 1971; in particular see Juster-Wachtel, "An Analysis of Ex ante savings Data:Some preliminary Results", pages 159-168.

[1]The survey questionnaires were designed in two distinct forms with somewhat different anticipations and attitude questions. The sub-sample of 603 observations includes all households who responded on one of the specific forms for the first three waves of the questionnaire, with the wife aged 30-39.

Table 7

Consumer Anticipation Survey
Subsample Description
Women Age 30-39*

(603 observations)

(A)

Selected Frequency Distributions
(number)

(1) Age of Husband
(in 1968)

| | 25-29 | 30-34 | 35-39 | 40-44 | 45-54 | 55-64 |
|---|---|---|---|---|---|---|
| Frequency: | 5 | 159 | 272 | 147 | 17 | 3 |

(2) Education of Each Spouse

| | ≤ 8 | 9-11 | 12 | 13-15 | 16 | ≥ 17 |
|---|---|---|---|---|---|---|
| Husband; frequency: | 5 | 7 | 87 | 113 | 203 | 188 |
| Wife[1]; frequency: | 0 | 19 | 211 | 172 | 158 | 42 |

(3) Total 1967 Family Income
(in thousands)

| | < 8 | 8-11 | 11+-13 | 13+-15 | 15+-20 | 20+- 30 | > 30 |
|---|---|---|---|---|---|---|---|
| Frequency: | 27 | 93 | 113 | 92 | 156 | 80 | 42 |

*Respondents for questionnaire Form A only.

[1]There is one observation with missing information.

Table 7 (cont'd.)

(B)

Ownership and Purchase of Durable Goods
(Percentage of Subsample of 603 Households)

| | Household Durable | | | | |
|---|---|---|---|---|---|
| | Kitchen Range | Washing Machine | Clothes Dryer | Refrigerator or Freezer | Dish Washer |
| Percentage Owning in May 1968: | 96.4 | 98.8 | 92.4 | 99.0 | 82.1 |
| Percentage Purchasing May 1968-Nov. 1968: | 2.0 | 4.5 | 2.5 | 6.3 | 3.2 |
| Nov. 1968-May 1969: | 2.7 | 4.6 | 3.2 | 3.8 | 4.0 |

households owning each of the five durable goods in May 1968 and the percentage which purchased each durable during each of the two six month intervals, May 1968-November 1968 and November 1968-May 1969.

In Table 8 the households are distributed into cells defined by the stated ex ante probability of purchasing one or more of the durables and by either the level of schooling of the wife (Panel A) or the level of schooling of the husband (Panel B) or the total 1967 family income (Panel C). The table indicates the percentage of households within each of the cells which did in fact purchase one or more of the durable goods within the twelve month interval May 1968-May 1969. For example, in Panel A there were 129 households in the cell defined by 12 years of schooling for the wife and a zero stated probability of purchasing a durable within the year. Of those 129 households, 21 (or 16 per cent) did in fact purchase a durable good within the year. For each row in Table 7, one observes a generally increasing fraction of the households purchasing the durable goods. That is, among households which indicated a high ex ante probability of purchasing the durable goods, the fraction of households actually purchasing the durable goods is relatively high.

Focusing on those levels of education of the wife with more than 100 observations, there appeared to be a somewhat stronger positive relationship between the ex ante stated probability of purchase and the actual frequency of purchase among more educated women (those with sixteen years of schooling) than among those with fewer years of schooling (ie, those with twelve years or thirteen to fifteen years of schooling ). This somewhat stronger positive relationship between stated probability of purchase and actual behavior among the more educated wives suggests that these more educated women might be better able to predict accurately their future expenditures.

Neither the education level of the husband or the total 1967

Table 8
Percentage of Households Purchasing Household Durables*

(A)

By ex ante stated probability of purchase and by education level of the wife

| Education of Wife (yrs.) | Purchase Probability (%) | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 10-20 | 30-50 | 60-80 | 90-100 | All |
| 9-11 | .18 (11)[1] | --- (0) | .60 (5) | .50 (2) | 1.0 (1) | .37 (19) |
| 12 | .16 (129) | .50 (24) | .56 (16) | .38 (24) | .61 (18) | .29 (211) |
| 13-15 | .15 (106) | .38 (16) | .47 (15) | .43 (14) | .43 (21) | .26 (172) |
| 16 | .11 (92) | .21 (24) | .46 (13) | .53 (15) | .64 (14) | .24 (158) |
| ≥ 17 | .11 (18) | .29 (7) | 1.0 (2) | .50 (4) | .64 (11) | .36 (42) |
| All | .14 (356) | .35 (71) | .53 (51) | .44 (59) | .57 (65) | .27 (602) |

* Household durables include kitchen range, washing machine, clothes dryer, refrigerator or freezer, and dishwasher.

1. cell size

Table 8

(continued)

(B)

by ex ante stated probability of purchase and by education level of the husband

| Education of Husband (yrs.) | Purchase Probability (%) | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 10-20 | 30-50 | 60-80 | 90-100 | All |
| 8 | 0.0<br>(3)[1] | ---<br>(0) | ---<br>(0) | .50<br>(2) | ---<br>(0) | .20<br>(5) |
| 9-11 | .40<br>(5) | 0.0<br>(1) | ---<br>(0) | 1.0<br>(1) | ---<br>(0) | .43<br>(7) |
| 12 | .22<br>(49) | .50<br>(6) | .50<br>(10) | .27<br>(11) | .82<br>(11) | .36<br>(87) |
| 13-15 | .14<br>(79) | .38<br>(8) | .88<br>(8) | .62<br>(8) | .60<br>(10) | .28<br>(113) |
| 16 | .13<br>(111) | .52<br>(27) | .48<br>(23) | .33<br>(24) | .56<br>(18) | .28<br>(203) |
| ≥ 17 | .11<br>(110) | .17<br>(29) | .40<br>(10) | .62<br>(13) | .46<br>(26) | .22<br>(188) |
| All | .14<br>(357) | .35<br>(71) | .53<br>(51) | .44<br>(59) | .57<br>(65) | .27<br>(603) |

1. cell size

Table 8
Continued

(C)
by total 1967 family income and by the fact of purchase

| Total Family Income ($1000) | Purchase Probability (%) | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 10-20 | 30-50 | 60-80 | 90-100 | All |
| 0-5 | 0.0<br>(1)[1] | 0.0<br>(1) | 1.0<br>(2) | 0.0<br>(1) | .50<br>(2) | .43<br>(7) |
| 5+ - 8 | .18<br>(17) | 1.0<br>(1) | ---<br>(0) | 0.0<br>(1) | 0.0<br>(1) | .20<br>(20) |
| 8+ - 11 | .11<br>(62) | .75<br>(8) | .56<br>(9) | .71<br>(7) | .86<br>(7) | .31<br>(93) |
| 11+ - 13 | .11<br>(54) | .38<br>(8) | .44<br>(16) | .26<br>(19) | .50<br>(16) | .26<br>(113) |
| 13+ - 15 | .11<br>(56) | .27<br>(15) | .57<br>(7) | .60<br>(5) | .56<br>(9) | .24<br>(92) |
| 15+ - 20 | .21<br>(90) | .27<br>(26) | .50<br>(8) | .44<br>(16) | .56<br>(16) | .29<br>(156) |
| 20+ - 30 | .14<br>(50) | .29<br>(7) | .57<br>(7) | .83<br>(6) | .70<br>(10) | .31<br>(80) |
| > 30 | .07<br>(27) | .40<br>(5) | .50<br>(2) | .25<br>(4) | .25<br>(4) | .17<br>(42) |
| All | .14<br>(3[illegible]) | 3[illegible]<br>(7[illegible]) | .53<br>(51) | .44<br>(59) | .57<br>(65) | .27<br>(603) |

1. cell size

family income appears to be as systematically related to the relative accuracy of the predictions. When cross-classified by either the education of the husband or 1967 total family income, the stated probability of purchase appears to distinguish couples relatively well at the low end of the probability scale--say from zero probability through probability of fifty per cent--but to have no discernible effect in distinguishing couples who indicated a probability of purchase in excess of fifty per cent.

In Table 9 the same set of households is distributed into cells defined by whether or not one of the five durable goods was purchased within the year following the initial survey and by the level of schooling of the wife (Panel A) or the level of schooling of the husband (Panel B) or the total 1967 family income (Panel C). For each cell the average value of the stated probability of purchase is shown. For example, in Panel A there are 61 households in the cell defined by 12 years of schooling of the wife and by the purchase of at least one of the five durable goods. Of these 61 households the average value of the households' probability of purchasing one or more of these durables, as stated in May 1968, was .40. By contrast, the average stated probability of purchase for those households which did not in fact purchase a durable in the year was .16.

One observes in Panel A a generally increasing mean value of the stated probability of purchase by education of the wife for couples who did in fact purchase a durable good within the year. This again suggests greater conformity of ex ante prediction and ex post actual purchase among the more educated women. Panels B and C of Table 9 indicate the comparable results cross-classified by education of the husband and total 1967 family income. Here again, while one observes general conformity with the expectations, the relationships between the prediction and the actual purchase appear to be less systematically related to the education of the husband or total 1967 family income.

Table 9
Mean Value of the Stated Probability of Purchase of a Household Durable*

(A)
by Education level of the wife and by the fact of purchase

| Education of wife (yrs) | Was a household durable purchased? yes | No |
|---|---|---|
| 8 | (0)[1] | (0) |
| 9-11 | .47 (7) | .15 (12) |
| 12 | .40 (61) | .16 (150) |
| 13-15 | .41 (44) | .19 (128) |
| 16 | .50 (38) | .14 (120) |
| ≥17 | .63 (15) | .24 (27) |
| All | .45 (165) | .17 (437) |

* Household durable includes kitchen range, washing machine, clothes dryer, refrigerator or freezer, and dishwasher.
1. cell size

Table 9
continued

(B)
by education level of the husband and by the fact of purchase

| Education of husband (yrs) | Was a household durable purchased? yes | no |
|---|---|---|
| 8 | .80 (1)[1] | .20 (4) |
| 9-11 | .27 (3) | .05 (4) |
| 12 | .46 (31) | .20 (56) |
| 13-15 | .42 (32) | .09 (81) |
| 16 | .42 (57) | .19 (146) |
| ≥17 | .50 (41) | .17 (147) |
| All | .45 (165) | .17 (438) |

1. cell size

Table 9
continued

(C)
by total 1967 family income and by the fact of purchase

| Total Family Income ($1000) | Was a Household Durable Purchased? | |
|---|---|---|
| | Yes | No |
| 0 - 5 | .67 (3)[1] | .50 (4) |
| 5+ - 8 | .03 (4) | .11 (16) |
| 8+ - 11 | .47 (29) | .08 (64) |
| 11+ - 13 | .53 (29) | .29 (84) |
| 13+ - 15 | .44 (22) | .12 (70) |
| 15+ - 20 | .37 (46) | .17 (110) |
| 20+ - 30 | .53 (25) | .11 (55) |
| > 30 | .37 ( | .18 (35) |
| All | .45 (165) | .17 (438) |

1. cell size

## CONCLUSIONS

Schooling seems to have a pervasive influence on observed behavior and the research undertaken as a part of this grant attempts to document some aspects of that influence. Only preliminary empirical work has been completed, hence no firm conclusions can be drawn. The initial results from the study of marital behavior are, I think, quite suggestive. Studies have indicated that additional years of schooling tend to be associated with postponement of marriage, and the consistently positive correlation between the education levels of spouses suggests that more educated individuals tend to select relatively more educated mates. It has also been observed in several studies that more educated women are more likely to remain single, but that for both sexes, more education is associated with a relative reduction in marital instability.

Theoretical models which view marriage as a contractual arrangement formalizing the formation of a household (which in turn is viewed as a production unit) provide explanations for these relationships between schooling and marital behavior. Asserting that there exists an informal market in which individuals seek out their most advantageous marriage arrangement (in terms of mate selection and the terms of the marriage agreement), these models are capable of interpreting the relationship between schooling level and age at marriage and between schooling level and marital stability. The interpretation rests on the optimal length of search and the efficiency of search for a marriage mate. The high positive correlation between the schooling levels of spouses and the observation that more educated women tend to remain single are, within the context of these models, related to the anticipated household production in marriage--to specialization and complementarity in household production.

Using a unique body of data on a group of geniuses (individuals with measured childhood I.Q.s above 135) I have begun to study the relationship between schooling and marital behavior. The results to

date suggest that the relationships between schooling and marital behavior among this group of geniuses is qualitatively the same as among the U.S. population as a whole. That is, the influence of schooling on this aspect of behavior is in evidence at a very high level of ability or intelligence as well as at more ordinary levels of ability.

High levels of schooling-- college and post graduate training-- appear to affect marital behavior somewhat differently than lower levels of schooling, but the evidence obtained from the sample of geniuses suggests that the high levels of schooling have the same effects among individuals of different innate ability. So the observed differences in effects at different levels of schooling are probably not the result of differences in ability levels.

A further tentative conclusion is that much of the effect of schooling on marital stability operates through an influence on age at marriage. Among these high-I.Q. subjects, the effect of schooling on age at first marriage is somewhat reduced (by comparison with the population at large) and thus the relationship with marital instability appears to be weaker. An intuitively attractive explanation, for which I have not as yet adduced evidence, is that the high-I.Q. subjects complete a given level of schooling at a relatively younger age, enter the "marriage market" at a younger age, marry at a younger age, and subsequently experience the degree of marital instability associated with that younger age at first marriage rather than the marital instability associated with their higher level of schooling.

It must be emphasized that these conclusions are quite tentative. A single piece of research is seldom if ever supportively conclusive, but the results discussed here are also preliminary. They do however suggest some very interesting and important interactions between the effects of schooling and ability on an important dimension of household behavior.

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